

## APPARATUS AND METHODS FOR PROTECTING VALUABLES

### Cross Reference to Related Application

- 5   **[0001]**        This application claims priority from US application No. 60/441,920 filed on 24 January, 2003, which is hereby incorporated by reference herein.

### Technical Field

- 10   **[0002]**        The invention relates to apparatus and methods for detecting when an object is disturbed and generating an alarm in response thereto. The invention has general application to protecting valuables. Some embodiments of the invention are applied to protect laptop computers or other portable electronic devices.

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### Background

- 15   **[0003]**        The theft or loss of valuable belongings is a problem, especially for those who need to leave or use such valuable belongings in public areas. Valuables may be stolen or tampered with if left unattended
- 20   even for short periods. A person's valuables can be exposed to risk by common events such as when the person goes to the washroom, takes time away from the office for lunch or coffee, travels by car, bus, train or airplane, or checks into a hotel. Items from purses, briefcases, luggage, wallets, cellular phones, Personal Digital Assistants (PDAs), digital
- 25   cameras, music players, Liquid Crystal Displays (LCDs), LCD projectors, and laptop computers are just some of the small, but valuable, items that thieves are targeting today.

[0004] The theft of a laptop computer can be particularly costly because laptop computers often store information that is confidential and/or very difficult to recreate. More and more laptop computers are used each year as mobile computing replaces conventional desktop  
5 computers. Over 100 million laptops are in use worldwide and laptop sales have been continuously increasing. In 2002 alone, notebook computer sales increased by 11% while more portable computers such as PC tablets were introduced to the market. Correspondingly, theft of laptop computers has also been increasing year by year. Last year, more  
10 than 640,000 laptops were stolen, resulting in a \$60 billion loss in both hardware and stored software and data. Roughly 65% percent of the total thefts occurred on the road and in airports while 29% took place at the office.

15 [0005] Guarding against the theft of portable valuables, and particularly portable computers and other electronic devices is a major issue that has yet to be appropriately addressed. Current anti-theft solutions and theft deterrent systems range from passive devices, such as tethers which can be used to lock a computer to a desk or table, to more  
20 complex separation detectors, 2-way signaling devices, and motion alarms.

[0006] Motion alarms can be triggered by an authorized user of the device if the user forgets to disarm the motion alarm before moving the  
25 valuable.

[0007] 2-way signaling devices extend the capability of monitoring a valuable further by allowing a user to screen signals and get feedback from the valuable. However, these devices are often complex and are undesirably hard to use.

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[0008] Scholder, US Patent 5,578,991 discloses a security system for a portable personal computer. The security system includes a sensor which detects when the computer is moved away from an object, such as the surface of a table on which the computer is sitting. The sensor is  
10 connected to trigger an alarm.

[0009] Andrews US patent 5,757,271 discloses a security system for a portable computer. A security device detects whether or not a second electronic device is nearby. In response to a detection that the  
15 second electronic device is not nearby a signal is generated indicating that a security violation has occurred. In one embodiment, wireless signals having an effective range equal to the selected proximity are transmitted from the second electronic device to the first electronic device. The security device determines that the first electronic device is  
20 not within the selected proximity of the second electronic device in response to a failure to receive the wireless signals.

[0010] D'Angelo , et al. US patent 5,963,131 discloses a motion sensitive theft detector system for portable articles featuring two way  
25 communication between the theft detector unit installed in or affixed to a portable article and a control unit carried by the owner. The theft detector communicates alerts to the control unit allowing the user to screen for

false alarms and to trigger an alarm at the portable article when warranted.

[0011] D'Angelo , et al. US patent 6,133,830 discloses a motion  
5 sensitive theft detector system for portable articles featuring two way  
communication between the theft detector unit installed in or affixed to  
the portable article and the control unit carried by the owner. The theft  
detector communicates alerts to the control unit allowing the user to  
screen for false alarms and to trigger an alarm at the portable article  
10 when warranted.

[0012] There remains a need for practical cost effective theft-  
deterrent devices and methods.

15 Summary of the Invention

[0013] One aspect of the invention provides a valuables monitoring  
system. The system comprises a disturbance detection mechanism  
comprising one or more sensors configured to generate a disturbance  
signal upon disturbance of an item being monitored; an alarm connected  
20 to be triggered by the disturbance signal; and a receiver configured to  
receive a wireless signal from a remote unit. An alarm inhibition  
mechanism is connected to selectively inhibit operation of the alarm.  
The alarm inhibition mechanism includes a mechanism responsive to  
signals from the remote unit received at the receiver to automatically  
25 inhibit the alarm if the received signals indicate that the remote unit is  
nearby.

[0014] Another aspect of the invention provides a method for monitoring an item. The method comprises providing a base unit attached to the item and a remote unit; detecting a proximity of the remote unit to the base unit and inhibiting an alarm if the remote unit is determined to be nearby the base unit. The alarm is triggered in response to a disturbance of the base unit unless the alarm is inhibited.

[0015] Further aspects of the invention and features of specific embodiments of the invention are described below.

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#### Brief Description of the Drawings

[0016] In drawings which illustrate non-limiting embodiments of the invention,

15 Figure 1 is a block diagram of apparatus according to a basic embodiment of the invention;

Figure 1A is a block diagram of apparatus more fully featured than the apparatus of Figure 1;

20 Figure 2 is a flowchart illustrating a process performed at a base unit of one embodiment of the invention;

Figure 3 is a flowchart illustrating a process performed at a remote unit cooperating with a base unit operating under the process of Figure 2;

Figure 4 is a schematic illustration showing a base unit having a locking mechanism for locking the base unit to an item to be protected;

25 Figure 5 is a flow chart illustrating a process for turning on a base unit in some embodiments of the invention; and,

Figure 6 is a flow chart illustrating a process for turning on a remote unit and turning off both a remote unit and a corresponding base unit in some embodiments of the invention.

5    Description

[0017]       Throughout the following description, specific details are set forth in order to provide a more thorough understanding of the invention. However, the invention may be practiced without these particulars. In other instances, well known elements have not been  
10   shown or described in detail to avoid unnecessarily obscuring the invention. Accordingly, the specification and drawings are to be regarded in an illustrative, rather than a restrictive, sense.

[0018]       The invention will be described with reference to example  
15   systems and methods for alerting a person when an item in their charge is tampered with and/or moved. Apparatus **10** according to a general embodiment of the invention is shown in Figure 1. A valuable item, **12** for example, a portable computer, is equipped with one or more sensors **13**. Sensors **13** detect disturbance (e.g. movement or tampering ) of item  
20   **12**. In some embodiments of the invention, sensor **13** comprises one or more tilt sensors, accelerometers, touch sensors, optical sensors or the like.

[0019]       An alarm **14** is coupled to receive signal(s) from sensor **13**.  
25   The alarm is triggered when sensor **13** generates a disturbance signal which indicates that item **12** is being disturbed (e.g. tampered with and/or moved). The alarm is inhibited when a wireless signal from a remote unit

**15** indicates that the remote unit is near to item **12**. In the embodiment of Figure 1, an alarm inhibition mechanism **16** receives a wireless signal from remote unit **15**. As long as the wireless signal indicates that remote unit **15** is nearby (for example, as long as the signal is stronger than a  
5 threshold value) alarm inhibition mechanism **16** inhibits alarm **14**. Alarm inhibition mechanism **16** may comprise, for example, an electronic circuit; a software process being executed by a data processor; or some combination thereof.

10 **[0020]** In some embodiments of the invention, apparatus **10** includes a transmitter **17** that transmits a notification signal to a receiver **18** in remote unit **15** when alarm **14** is triggered. In such embodiments, receiver **18** may be connected to trigger an alarm indicator **19** when the notification signal is detected. Alarm indicator **19** may comprise an  
15 audible, visual or tactile warning device, for example.

**[0021]** Apparatus **10** can be used simply. A user can keep remote unit **15** on his or her person. While the user remains near item **12**, alarm inhibition mechanism responds to the proximity of remote unit **15** and  
20 inhibits the operation of alarm **14**. The user can move and use item **12** without raising an alarm. If the user leaves the vicinity of item **12**, alarm inhibition mechanism **16** ceases to inhibit the operation of alarm **14**. While the user remains away from the immediate vicinity of item **12**, any disturbance detected by sensors **13** will trigger alarm **14**. If apparatus **10**  
25 includes a mechanism for transmitting a notification signal to remote unit **15** then alarm indicator **19** warns the user that an alarm has been triggered, even if the user is not in the immediate vicinity of item **12**.

[0022] An advantage of this embodiment of the invention is that the operation of apparatus **10** is simple for the user. The user does not need to manually arm and disarm apparatus **10** to switch alarm **14** between its enabled and disabled modes.

[0023] The components of apparatus **10** that are collocated with item **12** may be integrated with item **12** or may be combined in a base unit which can be attached to item **12**.

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[0024] Figure 1A shows a system **20** according to a more fully featured embodiment of the invention. System **20** includes a base unit **21** and a remote unit **22**. Remote unit **22** may be carried by a user. Base unit **21** may be affixed to a valuable to be protected.

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[0025] Base unit **21** includes a control circuit, which may conveniently comprise a microcontroller **24**. Microcontroller **24**, may comprise a suitable microcontroller chipset that allows for software programs to be stored and executed. In the alternative, the control circuit could comprise logic circuits which are configured specifically to provide one or more of the functions described herein. Such logic circuits could be provided on an application specific integrated circuit (ASIC), a field programmable gate array (FPGA) or by way of discrete components, for example.

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[0026] In the embodiment of Figure 1A, microcontroller **24** includes a clock, a central processing unit (CPU), random access memory



( RAM), and read only memory (ROM) which may be on one or more chips. Base unit **21** also includes a motion sensor circuit **25**, an alarm circuit **23**, an ON control **26**, and a two-way wireless communication mechanism.

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**[0027]** In the illustrated embodiment, the communication mechanism comprises an RF transceiver which includes a transmitter **28** and a receiver **27**. The transmitter **27** and receiver **28**, can be provided conveniently by the transmitter and receiver portions of a commercially available RF transceiver. These components could also be made up of discrete components. Any suitable communication protocol may be used for signalling between base unit **21** and remote unit **22**. In some embodiments, digital data is exchanged between base unit **21** and remote unit **22**. In some embodiments data is communicated by sending a low power RF signal that includes preamble data bits that allow other receivers to lock onto the frequency of transmission of transmitter **28**, an identifier comprising a sequence of bits unique to one remote unit **22**, and instruction bits which remote unit **22** can process.

20 **[0028]** Motion sensor circuit **25** includes one or more sensors. The sensors may include one or more:

- tilt switches;
- vibration sensors;
- accelerometers;
- 25 • proximity detectors;
- capacitive sensors;

- mechanical switches located to change state when the base unit is lifted away from a surface on which it is sitting;
- light detectors; and/or
- other sensors or combinations of sensors capable of generating an output signal indicative that base unit **21** is being moved, tampered with or otherwise disturbed.

**[0029]** An disturbance signal from motion sensor circuit **25** is provided to microcontroller **24**. Any suitable mechanism may be used to provide the disturbance signal to microcontroller **24**. For example, sensor circuit **25** could be configured to:

- set a flag, for example by writing a value to a data register;
- trigger an interrupt sequence in the microcontroller **24**;
- set a control line to a current or voltage level indicative of an alarm condition;
- or the like.

**[0030]** Siren circuit **23**, includes any suitable audible and/or visual alarm generator together with any necessary driving circuits.

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**[0031]** ON control **26**, may comprise a pushbutton or other input mechanism coupled to a circuit which causes base unit **21** to power up.

**[0032]** Remote unit **22** includes a control circuit. The same general design options available for the control circuit of base **21** are also available for the control circuit of remote unit **15**. In the illustrated remote unit **22** a microcontroller **33** provides control functions.

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**[0033]** Remote unit **22** also includes a notification circuit **34**, an ON/OFF control **31**, a DISARM control **32**, and a two-way wireless communication mechanism compatible with the wireless communication mechanism of base unit **21**. In the illustrated embodiment, the communication mechanism of remote unit **22** comprises a transmitter **30** capable of broadcasting a wireless signal which can be received by receiver **27** of base unit **21** and a receiver **29** capable of receiving signals broadcast by transmitter **28** of base unit **21**.

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**[0034]** The signals exchanged by the wireless communication mechanism are preferably encoded. The use of encoded signals allows several systems **20** to operate in the same vicinity even if the wireless communication mechanisms of the systems operate at the same frequencies. Encoding and decoding of signals exchanged between remote unit **22** and base unit **21** may be performed by microcontrollers **24** and **33** or, in the alternative, by separate encoder / decoder systems. Microcontrollers **24** and **33** may be configured to ignore signals that are not encoded in the manner associated with the corresponding unit **21** or **22**.

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**[0035]** Wireless communications between a remote unit **21** and a base unit **22** may be carried by radio frequency signals. A suitable frequency-hopping algorithm may be used to reduce the likelihood of interference with signals from other systems **20** or other devices operating in a frequency range of the radio frequency signals. Various

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suitable frequency-hopping systems are known to those skilled in the art of radio frequency communications.

[0036] Notification circuit **34** comprises a device for alerting a user  
5 carrying remote unit **22**. Remote unit **22** may include a sound-emitting device such as a speaker or buzzer, a light emitting device, a tactile device, such as a vibrator, and any circuitry necessary to drive the device.

[0037] ON/OFF control **31** and DISARM control **32** each comprise  
10 a suitable input mechanism, such as a pushbutton, which can be activated by a user.

[0038] When system **20** is off, it can be turned on by actuating ON control **26** on base unit **21** and actuating ON/OFF control on remote unit  
15 **22**. It is noteworthy that, in the illustrated embodiment, there is no control on base unit **21** for turning system **20** off. System **20** can be turned off by actuating ON/OFF control **26** of remote unit **15**. This makes it difficult for a malicious individual to interfere with the proper operation of system **20** by turning off base unit **21**.

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[0039] System **20** may include a soft switch mechanism which controls switching both remote unit **22** and the base unit **21** between their active modes and standby modes. The soft switch mechanism may use both software and hardware circuitry to accomplish its task. Figures 5  
25 and 6 illustrate methods performed by an example embodiment of such a soft switch mechanism at the base unit and remote unit respectively. As shown in Figure 5, activating ON control **26** moves process **80** from

block **81** to block **82**. Block **82** causes power to be supplied to microcontroller **24** and other circuits of base unit **21**. After process **80** has left block **81**, activating the ON control **26** additional times has no effect. Process **80** then waits to receive an off signal **83** from remote unit  
5 **22**. When an OFF signal (encoded in the expected manner) is received by way of receiver **27**, process **80** moves to block **84** which causes power to microcontroller **24** and other circuits of base unit **21** to be being turned off. Base unit **21** can be turned off only by way of remote unit **22** .

10 **[0040]** Figure 6 illustrates a process **90** which is invoked when remote unit **22** is off and ON/OFF control **31** is actuated by a user in block **91**. Operation of ON/OFF control **31** causes power to be supplied to microcontroller **33** and other circuits of remote unit **22** in block **92**. Process **90** then moves to block **93** where it remains until the user  
15 operates ON/OFF control **31** again. Preferably, block **93** requires the user to keep ON/OFF control **31** actuated for at least a short while. This reduces the likelihood that the user could accidentally turn system **20** off.

**[0041]** When block **93** detects that ON/OFF control **31** has been  
20 actuated for a sufficient time, process **90** moves to block **94**. The exact time for which ON/OFF control **31** must be actuated is not critical. The time is chosen to be longer than any anticipated accidental actuations of ON/OFF control **31**. In block **94**, process **90** sends an OFF signal to base unit **21** by way of transmitter **30** (assuming that base unit **21** is on and  
25 process **80** is on block **83** the OFF signal causes base unit **21** to turn off).

Process **90** then completes at **95** by turning the power off to remote unit **22**.

**[0042]** When system **20** is operating, programs running on  
5 microcontrollers **24** and **33** cause signals to be exchanged periodically  
between base unit **21** and remote unit **22**. From the signals received at  
base unit **21**, microcontroller **24** can determine when remote unit **22** is  
nearby. The signals sent by base unit **21** to remote unit **22** may include  
signals which indicate that sensor system **25** has detected disturbance.  
10 The signals sent by remote unit **22** to base unit **21** may include OFF  
signals, and/or other control signals.

**[0043]** During normal operation, each of remote unit **22** and base  
unit **21** expect to periodically receive a coded signal from the other every  
15 so often.

**[0044]** Figure 2 illustrates a flowchart for an operating process **40**  
performed by microcontroller **24** of base unit **21** in one embodiment of  
the invention. Process **40** commences at block **41** when microcontroller  
20 **24** is either powered up or woken up from a low-power idle mode. Once  
microcontroller **24** is activated, process **40** proceeds to step **42** where  
receiver **27** is set to receive mode for a short period of time. While  
receiver **27** is in receive mode, microcontroller **24** processes any received  
bits and checks to see if a valid signal from the corresponding remote  
25 unit **22** has been received. If such a signal is received then block **43** uses  
the signal to determine whether or not remote unit **22** is nearby.

[0045] Block 43 may include generating a request signal at transmitter 28 which, when received by remote unit 22 causes remote unit 22 to automatically transmit a ranging signal. The ranging signal may be used by base unit 21 to determine whether or not remote unit 22 is nearby as described above.

[0046] Various methods can be used to determine whether remote unit 22 is nearby. These include:

- Sending a low power ranging signal from remote unit 22 to base unit 21. If the low power signal is successfully received then block 43 concludes that remote unit 22 is nearby. If the low power signal is not received then block 43 concludes that remote unit 22 is not nearby. The power of the low-power signal sent by remote unit 22 and/or the sensitivity of receiver 27 may be set to adjust the maximum distance at which the low-power signal can be received by base unit 21. The low power ranging signal may have the same or a different power level than other signals exchanged between base unit 21 and remote unit 22.
- At base unit 21 measuring the strength of a signal originating from remote unit 22 and comparing the measured signal strength to a threshold value. Since signal strength falls off with distance, the remote unit 22 can be considered to be nearby if the signal strength exceeds the threshold value. Any or all of the threshold value, the strength of the transmitted signal, and an attenuation of the received signal prior to measuring the signal strength may be varied to adjust the maximum distance at which the received signal strength can exceed the threshold.

[0047] If block 43 determines that the remote unit is nearby then process 40 proceeds to sleep 44. In the alternative, if process 40 does not determine that the remote unit 22 is nearby then process 40 proceeds to  
5 block 45. In block 45, base unit 21 sends a reminder signal to remote unit 22 the reminder signal is sent by way of transmitter 28. When remote unit 22 receives the reminder signal, microcontroller 33 causes a reminder action to be generated at remote unit 22. The reminder action may comprise generating a tone or other audible signal, flashing or  
10 blinking an indicator light, vibrating slightly or the like. The reminder action reminds the person carrying remote unit 22 that the base unit 21 and associated valuable have been left behind. This feature enables the user to be notified with a subtle beep or visual queue once they are separated from their valuable, in case they simply forgot to bring it with  
15 them.

[0048] Process 40 now proceeds to block 47. In block 47 microcontroller commences monitoring the output of sensor system 25 for signals indicative that base unit 21 has been moved or tampered with.  
20 If no motion or tampering is detected, process 40 goes back to sleep in block 44.

[0049] If motion or tampering is detected in block 47, base unit 21 sends a notification signal by way of transmitter 28. The notification  
25 signal is received by remote unit 22 if remote unit 22 is not too far away. When remote unit 22 receives the notification signal, remote unit 22 generates a notification action distinct from the reminder action. The



notification action may comprise an audio, visual or tactile signal or a combination thereof.

**[0050]** Base unit **21** also initiates a timer (block **49**) in response to  
5 detecting the motion or tampering. The timer provides the person who  
has remote unit **22** with an opportunity to disarm base unit **21** before  
alarm **23** sounds, and thereby avoid an undesired alarm from being issued  
by base unit **21**. Process **40** then places base unit **21** in receive mode  
(block **50**) and loops around blocks **51** and **52** until the timer expires or a  
10 DISARM signal is received from remote unit **22**. If block **51** detects a  
DISARM signal before the timer expires then process **40** proceeds to  
sleep **44**. If block **52** determines that the timer has expired then process  
**40** proceeds to block **53** which activates siren **23**.

15 **[0051]** After turning on siren **23**, process **40** causes receiver **27** to  
listen for a DISARM signal from remote unit **22** in block **55**. When the  
DISARM signal is received then base unit **21** turns siren **23** off at block  
**56**. After turning the siren off, microcontroller **24** and transceiver (**27** and  
**28**) enter sleep mode once again at **44**.

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**[0052]** Process **40** operates on base unit **21** which operates in  
conjunction with remote unit **22**. A software program executing on  
microcontroller **33** may coordinate the operation of remote unit **22**. A  
process **60** that may be followed by such a program is illustrated in  
25 Figure Figure 3. Process **60** commences at block **61** where  
microcontroller **33** is either powered up or woken up from a low power  
idle mode.

[0053] Process 60 then proceeds to block 62 wherein it controls transmitter 30 to transmit a RF signal at low power and then proceed immediately to place receiver 29 into receive mode at block 63. If, during  
5 this receive mode, receiver 29 detects a reminder signal from base unit 21, as indicated by block 64 then process 60 proceeds to block 65 which generates the reminder action (e.g. a short indicator from notification circuit 34). Process 60 then proceeds to block 66 which causes microcontroller 33 to go to sleep 66.

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[0054] If block 67 determines that a notification signal has been received (i.e a signal indicating that movement or tampering have been detected at base unit 21 then process 60 proceeds to block 68. At block 68, the notification action is performed (e.g. notification circuit 34 is  
15 turned fully on).

[0055] After the notification action has been initiated, process 60 checks in block 69 to see if the user has actuated DISARM control 32. If so, then a DISARM signal is sent by way of transmitter 30 at block 70.  
20 The notification action is discontinued at block 71. If block 69 does not detect that the user has actuated DISARM control 32 then process 60 remains at block 69.

[0056] Base unit 12 may be associated with a valuable item to be  
25 protected in any of various ways. For example, in various embodiments:

- Base unit 21 includes a lock which allows it to be physically attached to devices like laptops, liquid crystal display monitors,

and projectors. The lock may engage a security slot (one example being a Kensington slot), a PC card interface of a computer, a PC Universal Serial Bus port of a computer, a floppy disk drive of a computer or the like.

- 5     •     Base unit **21** is integrated into a valuable item to be protected - for example as part of a motherboard of a laptop computer. or
- Base unit **21** is affixed to a valuable item to be protected with a fastening means such as screws, bolts, rivets, an adhesive, or the like.

10   Figure 4 shows a base unit **21** having a locking mechanism **19** according to one embodiment of the invention. Locking mechanism **19** may comprise a cable lock and may be adapted to lockingly engage a security slot of the type sometimes provided on laptops, LCDs, and LCD projectors and the like.

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[0057]       Base unit **21** and remote unit **22** may each have an internal power supply **129**, typically a battery. In many applications of the invention it is desirable to make base unit **21** and remote unit **22** lightweight for easy portability. In such cases power management is

20   important because there is a limit to the capacity of lightweight batteries. Power consumption can be minimized, by having microcontrollers **24** and **33** spending significant proportions of the time in sleep modes.

[0058]       There are a wide range of suitable mechanisms for causing a

25   microcontroller to wake up periodically from a low power (or “sleep”) mode to perform a necessary process and then return to the low power mode. For example:

- A software timer may operate while the processor is in sleep mode. The software timer may interrupt the microcontroller (24, 33) when it is time to wake up.
- A separate timer, such as a digital logic counter coupled to a  
5 system clock may be connected to pass an elapsed time signal to the microcontroller or to another part of the circuit. For example, a microcontroller might set the timer to expire after a certain period of time. Upon the time period ending the timer could cause a flag to be set or send a signal to some circuitry indicating that time has  
10 expired.

**[0059]** By operating microcontrollers and/or other circuits at full power only some of the time, overall power consumption can be significantly reduced. In some cases, power can be on less than half of  
15 the time, and in another case it can be on for only a quarter of the time, and in yet another case can be on for less than an eighth of the time, and so on.

**[0060]** Power can further be conserved by operating transceivers of  
20 the base unit and remote unit to exchange information according to a protocol that minimizes the amount of time that the transceivers are operating and especially minimizes transmitting operations.

**[0061]** Certain implementations of the invention comprise computer  
25 processors which execute software instructions which cause the processors to perform a method of the invention. For example, one or more processors in a base unit may implement the methods of Figure 2

by executing software instructions in a program memory accessible to the processors. The invention may also be provided in the form of a program product. The program product may comprise any medium which carries a set of computer-readable signals comprising instructions which, when  
5 executed by a computer processor, cause the data processor to execute a method of the invention. Program products according to the invention may be in any of a wide variety of forms. The program product may comprise, for example, physical media such as magnetic data storage media including floppy diskettes, hard disk drives, optical data storage  
10 media including CD ROMs, DVDs, electronic data storage media including ROMs, PROMS, EPROMS, flash RAM, or the like or transmission-type media such as digital or analog communication links.

**[0062]** Where a component (e.g. a software module, processor,  
15 assembly, device, circuit, etc.) is referred to above, unless otherwise indicated, reference to that component (including a reference to a "means") should be interpreted as including as equivalents of that component any component which performs the function of the described component (i.e., that is functionally equivalent), including components  
20 which are not structurally equivalent to the disclosed structure which performs the function in the illustrated exemplary embodiments of the invention.

**[0063]** As will be apparent to those skilled in the art in the light of  
25 the foregoing disclosure, many alterations and modifications are possible in the practice of this invention without departing from the spirit or scope thereof. For example:

- Alarm inhibition circuit **16** could inhibit triggering of alarm **14** or, in the alternative, could inhibit the effect of alarm **14**, for example, by silencing audible warnings and/or disabling visual alarm displays provided by alarm **14**.
- 5 • In addition to sounding an alarm upon a possible theft attempt, base unit **21** could be configured to activate or protect the valuable further by locking down peripherals of a laptop, encrypting data, connecting to a global positioning system in order to track the valuable or the like.
- 10 • The invention is not limited to use in protecting inanimate valuable items. The methods and components described herein may also be used for monitoring pets or children. For example, a base unit **21** could be incorporated into a bracelet to be worn by a child or a collar to be worn by a pet.
- 15 • The signals exchanged between a base unit and a remote unit do not need to be radiofrequency signals. Other types of wireless signals, such as ultrasonic signals could be used in the alternative.
- It is not mandatory that the same type of signals used to carry information (e.g. OFF signals, DISARM signals, REMINDER  
20 signals, NOTIFICATION signals) be used to determine when remote unit **22** is near to base unit **21**. For example, an ultrasonic signal could be used for ranging while radiofrequency signals are used to carry information receivers in the base and/or remote units may include receivers for different signal types.
- 25 • Signals used to carry information between a base unit and remote unit may have different strengths, frequencies, formats etc. from signals used to determine when the corresponding remote unit is

nearby to a base unit. In some embodiments low strength ranging signals are used for determining whether the remote unit is nearby to the base unit and some or all of the information carrying signals have significantly greater ranges than the ranging signals.

- 5     •     Ranging signals could also be used to carry information between a base unit and a remote unit or vice versa.
- In some of the embodiments described above, a low strength ranging signal is sent from the remote unit to the base unit. The base unit knows that the remote unit is nearby if it receives the low strength ranging signal. The invention could also be practised by  
10     sending a low strength ranging signal from the base unit to the corresponding remote unit. The remote unit could be configured to generate a reply signal upon detecting the low strength ranging signal. In such embodiments the base unit would know that the  
15     remote unit is nearby if it receives reply signals in response to its low strength ranging signals.
- ON/OFF control **31** may be replaced with separate ON and OFF controls.
- The frequencies of signals used by a system do not need to be  
20     fixed. The system may have the capability to vary the operating frequency to prevent interference from other products working in the same RF band or signal frequency.

Accordingly, the scope of the invention is to be construed in accordance with the substance defined by the following claims.